

What is claimed is:

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1. A gateway (GW) apparatus for communicating between networks, said GW apparatus comprising:

5 (a) first message input/output means for sending and receiving a message to/from a first network;

(b) second message input/output means for communicating a second network based on an internet protocol (IP);

(c) a first plug-in detector for detecting a plug-in of a first device to the first network;

10 (d) a virtual device functioning a gateway for the first device plugged in the first network and a second device plugged in a second network to communicate with each other;

15 (e) a virtual-device-controller for providing said virtual device corresponding to the first device plugged-in with an IP identifier, for the second network accessing to said virtual device, responsive to information supplied from said first plug-in detector;

20 (f) a pseudo-address generator for generating a pseudo address for said virtual device to communicate with the first device in the first network upon receiving a connection request from the second device in the second network, and for outputting the pseudo address to said virtual-device-controller; and

(g) an address-correspondence-controller for controlling correspondence between the IP identifier and the pseudo address provided to said virtual device by said virtual-device-controller.

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2. The GW apparatus as defined in Claim 1 further comprising:

(h) a second plug-in detector for detecting a plug-in of the

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second device by monitoring "a directory supplying information about the second device in the second network"; and

(i) a registry register for registering in a registry in the first network,

5 wherein said controller further acquires the information about
the second device from the directory, and establishes a virtual device
corresponding to the second device based on the information acquired,

wherein said GW apparatus allows the first device to detect the second device plugged-in the second network and acquires interface information via the registry.

3. The GW apparatus as defined in Claim 1 further comprising:

(j) a directory register for registering information about the first device plugged-in to the directory of the second network,

15 wherein said first plug-in detector detects the plug-in of the
first device by monitoring an event in the first network,

wherein said virtual-device-controller acquires information about the first device plugged-in the first network from a registry on the first network, and has said virtual device include a virtual device corresponding to the first device plugged-in based on the information acquired;

wherein said GW apparatus allows the second device to detect the first device plugged-in the first network via a registry on the second network.

25 4. The GW apparatus as defined in Claim 3 further comprising:

(k) a stream controller for controlling a stream transfer between the first devices on the first network;

(l) a stream-port-correspondence-controller for controlling correspondence between a stream input/output identifier on the first network and a stream port on the second network;

(m) a stream packet converter for converting a stream packet on the first network to a stream packet on the second network and vice versa, and sends/receives thereof,

wherein said virtual device establishes a stream connection to the second device plugged-in the second network, and has a stream generator for holding a band when necessary,

10 wherein said GW apparatus transfers a stream between a device on the first network and a device on the second network.

5. The GW apparatus as defined in Claim 3 further comprising:

15 (o) an information acquirer for acquiring information necessary for forming a user interface;

(p) a user interface (UI) generator for generating a UI to be used on the second network based on the information acquired; and

(q) a UI provider for transferring the UI generated when the second device requests to access to the first network.

20 wherein said controller detects a plug-in of a device to the first network, and determines whether or not the device plugged-in supports a protocol on the first network, and when said controller determines the protocol is supported, said information acquirer acquires necessary information for forming the UI by communicating with the device,

25 wherein said GW apparatus allows the second device on the second network to display the UI for manipulating the first device on the first network.

6. The GW apparatus as defined in Claim 1 further comprising:

(r) a registry of the first network;

5 (s) a download for downloading necessary information to said virtual device by accessing to an information-provider-site providing information about said virtual device;

10 wherein said virtual-device-controller detects a plug-in of the first device, searches the registry for information about the first device plugged-in, and acquires the information,

15 wherein said controller further includes an information acquirer for acquiring the information from the provider site based on the device information acquired from the registry when said controller determines one of two cases; (i) other cases than a case where said virtual device includes a virtual device corresponding to one of the first device plugged-in and the second device plugged-in, and (ii) a case where said controller determines that said virtual device needs to update a software version thereof.

7. The GW apparatus as defined in Claim 1 wherein said virtual device includes:

20 (d-1) a connection controller for controlling a correspondence between the first device and the second device;

(d-2) a command converter for converting a first command issued from the first network into a second command issued from the second network and vice versa;

25 (d-3) a command-correspondence-controller for controlling a correspondence between the first and the second commands; and

(d-4) an address converter for transferring a first message

issued from the first network to the second network and vice versa.

8. A method of gateway for communicating between a first device plugged-in a first network and a second device plugged-in a second network by using a virtual device; said method comprising:

5 (a) transmitting and receiving a message to/from the first network;

10 (b) communicating with the second network following an internet protocol (IP);

15 (c) acquiring information about the first device by detecting a plug-in of the first device in the first network;

(d) providing an IP identifier to the virtual device corresponding to the first device plugged-in responsive to the information acquired in step (c) for accessing to the virtual device from the second network;

20 (e) upon receiving a connection request from the second device, the virtual device generates a pseudo address for communicating with the first device plugged-in; and

(f) communicating between the first network and the second network responsive to the correspondence between the pseudo address provided to the virtual device and the IP identifier.

9. The method of gateway as defined in Claim 8 further comprising:

25 (g) detecting a plug-in of the second device by monitoring a directory which provides information about the second device in the second network;

(h) providing the virtual device with an address, and

registering the address to a registry of the first network,

wherein said step (d) further comprising:

(d-1) acquiring information about the second device from the directory, and setting the virtual device corresponding to the second device based on the information acquired; and

(d-2) detecting the second device plugged-in the second network from the first device via the registry, and acquiring interface information.

10 10. The method of gateway as defined in Claim 8 further comprising:

(i) detecting the plug-in of the first device by monitoring an event in the first network,

(j) registering the information about the first device to a directory which provides information about the second device in the second network;

15 wherein said step (d) further comprising:

acquiring the information about the first device plugged-in the first network from a registry of the first network, so that the virtual device includes a virtual device corresponding to the first device;

20 detecting the first device plugged-in from the second device via the directory, and acquiring interface information.

11. The method of gateway as defined in Claim 8 further comprising:

(k) carrying out a stream transfer between the first devices of

25 the first network;

(l) storing a correspondence between an identifier of stream input/output plug of the first network and a stream port of the second network;

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(m) converting a stream packet of the first network to/from a stream packet of the second network, and transmitting/receiving the packet converted; and

5 (n) establishing a stream connection to the second device plugged-in the second network, and holding a band when necessary,
wherein said method carries out the stream transfer between the first network and the second network.

10 12. The method of gateway as defined in Claim 10 further comprising:

(o) acquiring information necessary for forming a user interface;

(p) generating the user interface to be used in the second network using the information acquired; and

15 (q) transferring the user interface upon a request of accessing to the first device from the second device,

wherein said step (d) further comprising:

detecting the plug-in of the first device;

20 determining whether or not the first device plugged-in supports a protocol of the first network for providing the user interface; and

when determining the first device supports the protocol, acquiring information necessary for forming the user interface by communicating with the first device,

25 wherein said method allows the second device to display the user interface for manipulating the first device.

13. The method of gateway as defined in Claim 8 further comprising:

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(r) accessing to an information provider site which provides information about the virtual device, and downloading the information to the virtual device,

5 wherein said step (d) further comprising:

10 detecting the plug-in of the first device, searching a registry of the first network, and acquiring the information about the first device,

15 wherein said step (e) further includes:

20 acquiring information from a provider site based on the device information acquired from the registry when one of two cases is determined; (i) other cases than a case where the virtual device includes another virtual device corresponding to one of the first device plugged-in and the second device plugged-in, and (ii) a case where the virtual device needs to update a software version thereof.

25 14. The method of gateway as defined in Claim 8, wherein said step (d) further comprising:

30 storing a connection between the first and second devices into the virtual device;

35 converting a first command issued from the first network into a second command, and the second command issued from the second network into the first command so that both the commands can be executed by either one of the first and second network;

40 storing a correspondence between the first and the second commands into the virtual device; and

45 transferring the message issued from the first network and the second network between the first and the second networks by the virtual

device following the connection stored as well as the command stored.